

Shanshan Yu

Shanshan.Yu@jpl.nasa.gov

Jet Propulsion Laboratory, M/S 183-301, 4800 Oak Grove Drive, Pasadena, CA 91109

Tel: (818) 354-5829, (626) 394-7488

EDUCATION:

- **Ph.D. in Physical Chemistry, Chemistry Department, University of Waterloo, Waterloo, Canada, Sept. 2003-April 2007**

Supervisor: Professor Peter Bernath

Thesis title: High-Resolution Laboratory Spectroscopy of Transient Metal-Containing Molecules

Courses taken: Spectroscopy, Atmospheric Remote Sensing, Chemical Instrumentation, Quantum Chemistry, Theory and Practice of Computational Chemistry (GPA: 94.6/100)

- **M.Sc. in Optics, Physics Department, East China Normal University, Shanghai, China, Sept. 2000-July 2003**

Supervisor: Professor Yangqin Chen

Thesis title: Study of Hot Bands of the $B^2\Sigma_u^+ - X^2\Sigma_g^+$ System of C_2^- Anion by Optical-Heterodyne Magnetic-Rotation Enhanced Velocity Modulation Spectroscopy

- **B.Eng. in Optoelectronics, Physics Department, East China Normal University, Shanghai, China, Sept.1996-July 2000**

RESEARCH INTERESTS:

- **Laboratory Terahertz Spectroscopy of Radicals and Ions of Astrophysical Interest.**
- **Laboratory High-Resolution Infrared and Visible Spectroscopy of Transient Molecules with Lasers and Fourier Transform Spectrometers**

RESEARCH EXPERIENCE:

- **NASA Postdoctoral Scholar at Jet Propulsion Laboratory, advisor Dr. Brian Drouin, Mar. 2008-present**
 - Laboratory Terahertz Spectroscopy and Global Analysis of H_3O^+
 - Laboratory Terahertz Spectroscopy and Global Analysis of DCCD
- **Graduate Research Assistant and Postdoc for Dr. Takayoshi Amano, University of Waterloo, Oct. 2006-November 2007**
 - Measured Submillimeter-Wave Absorption Spectra of HCO^+ and DCO^+
 - Synthesized HCO^+ and DCO^+ with an extended negative glow discharge
 - Recorded pure rotational spectra of HCO^+ and DCO^+ in the excited vibrational states
- **Graduate Research Assistant for Dr. Peter Bernath, University of Waterloo, Sept.2003-April 2007**
 - Measured and Analyzed Fourier Transform Infrared and Near-Infrared Emission Spectra of Metal-Containing Molecules

- Synthesized SbH, SbD, TeH, TeD, CdH₂, CdD₂ and HZnCl in the gas phase using a high temperature tube furnace with an electrical discharge. Synthesized CoS and NiS in the gas phase using a carbon tube furnace (King furnace)
- Recorded their emission spectra using a Bruker IFS 120 HR Fourier transform spectrometer
- Rotationally assigned their spectra utilizing a Loomis-Wood program
- Performed least-squares fits and obtained new or improved spectroscopic constants
- Modified least-squares fitting codes (FORTRAN) to successfully fit perturbed lines observed in TeH and CdH₂
- Interpreted Vibration-Rotation Spectrum of Hot BeF₂
 - Rotationally assigned 13 new hot bands for previous recorded and unanalyzed congested portion of the spectrum of BeF₂ with the assistance of a Loomis-Wood program.
 - Performed least-squares fits and obtained much improved spectroscopic constants for BeF₂
 - Modified fitting codes (BASIC) to simultaneously fit observed vibrational term values and rotational constants to obtain equilibrium vibrational and rotational constants for BeF₂.
- Conducted Optical-Optical Double-Resonance and Laser Excitation Spectroscopy of SrOD
 - Synthesized SrOD using a Broida-type oven
 - Recorded and rotationally assigned the spectra
 - Performed least-squares fits and obtained new spectroscopic constants for SrOD
- Investigated BaOH using Laser Excitation Spectroscopy
 - Synthesized BaOH using a laser-ablation/molecular jet spectrometer
 - Obtained laser excitation spectra of BaOH
 - Rotationally assigned the spectra and performed least-squares fits
 - Calibration of the spectra in progress
- **Graduate Research Assistant, East China Normal University, 2000-2003**
 - Constructed a spectroscopic apparatus containing a combination of optical-heterodyne amplification, Zeeman-magnetic rotation modulation, velocity modulation or concentration modulation techniques
 - Measured and analyzed high-resolution laser absorption spectra of the transient molecular anion, C₂⁻ and obtained improved spectroscopic constants

TEACHING EXPERIENCE:

- Graduate teaching assistant (demonstrator) in first year chemistry laboratory, University of Waterloo, 2003-2006
- Graduate teaching assistant (tutor) in General Physics, East China Normal University, 2000-2001

PUBLICATIONS:

19. S. Yu, B.J. Drouin, J.C. Pearson and H.M. Pickett, "Terahertz spectroscopy and global analysis of the bending vibrations of acetylene ¹²C₂D₂", in preparation.
18. S. Yu, B.J. Drouin, J.C. Pearson and H.M. Pickett, "Terahertz spectroscopy and global analysis of H₃O⁺", Astrophys. J. Suppl. (In press).

17. T. Hirao, **S. Yu** and T. Amano, "Submillimeter observation of HCO^+ in the excited vibrational states", J. Mol. Spectrosc. 248 (2008) 26-40.
16. T. Hirao, **S. Yu** and T. Amano, "Submillimeter-wave spectroscopy of DCO^+ in the excited vibrational states: Does the Stark effect cause anomalies in the (02^2_0) state?", J. Chem. Phys. 127 (2007) 074301/1-074301/12.
15. J.-G. Wang, M.J. Dick, P.M. Sheridan, **S. Yu** and P.F. Bernath, "Further spectroscopic investigations of the high energy electronic states of SrOH: The $\tilde{B}'^2\Sigma^+ - \tilde{A}^2\Pi 0_0^0$ and the $\tilde{D}^2\Sigma^+ - \tilde{A}^2\Pi 0_0^0$ transitions", J. Mol. Spectrosc. 245 (2007) 26-33.
14. R.S. Ram, I. Gordon, T. Hirao, **S. Yu**, P.F. Bernath and B. Pinchemel, "Fourier transform emission spectroscopy of the $C^3\Delta - X^3\Phi$, $D^3\Delta - X^3\Phi$, $G^3\Phi - X^3\Phi$ and $G^3\Phi - C^3\Delta$ systems of CoCl", J. Mol. Spectrosc. 243 (2007) 82-90.
13. **S. Yu**, J-G Wang, P.M. Sheridan, M.J. Dick and P.F. Bernath, "Laser spectroscopy of the $\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+ 0_0^0$ and $\tilde{C}^2\Pi - \tilde{A}^2\Pi 0_0^0$ transitions of SrOD", J. Mol. Spectrosc. 240 (2006) 26-31.
12. **S. Yu**, I.E. Gordon, P.M. Sheridan and P.F. Bernath, "Infrared emission spectroscopy of the $A^4\Phi_i - X^4\Delta_i$ and $B^4\Pi_i - X^4\Delta_i$ transitions of CoS", J. Mol. Spectrosc. 236 (2006) 255-259.
11. M.J. Dick, P.M. Sheridan, J.-G. Wang, **S. Yu** and P.F. Bernath, "Optical-optical double resonance spectroscopy of the $\tilde{D}^2\Sigma^+ - \tilde{A}^2\Pi$ transition of CaOH", J. Mol. Spectrosc. 240 (2006) 238-243.
10. **S. Yu**, A. Shayesteh, P.F. Bernath and J. Koput, "The vibration-rotation emission spectrum of hot BeF_2 ", J. Chem. Phys. 123 (2005) 134303/1-134303/8.
9. **S. Yu**, A. Shayesteh and P.F. Bernath, "The vibration-rotation emission spectra of gaseous CdH_2 and CdD_2 ", J. Chem. Phys. 122 (2005) 194301/1-194301/6.
8. **S. Yu**, A. Shayesteh, D. Fu and P.F. Bernath, "The vibration-rotation emission spectrum of gaseous HZnCl ", J. Phys. Chem. A 109 (2005) 4092-4094.
7. **S. Yu**, A. Shayesteh, D. Fu and P.F. Bernath, "Infrared and near infrared emission spectra of TeH and TeD", J. Mol. Spectrosc. 230 (2005) 105-116.
6. **S. Yu**, D. Fu, A. Shayesteh, I.E. Gordon, D.R.T. Appadoo and P.F. Bernath, "Infrared and near infrared emission spectra of SbH and SbD", J. Mol. Spectrosc. 229 (2005) 257-265.
5. A. Shayesteh, **S. Yu** and P.F. Bernath, "Gaseous HgH_2 , CdH_2 , and ZnH_2 ", Chem. Eur. J. 11 (2005) 4709-4712.
4. A. Shayesteh, **S. Yu** and P.F. Bernath, "Infrared emission spectra and equilibrium structures of gaseous HgH_2 and HgD_2 ", J. Phys. Chem. A 109 (2005) 10280-10286.
3. B. Li, X. Yang, Y. Guo, K. Kaniki, **S. Yu**, Y. Liu and Y. Chen, "Laser spectroscopy study of the (4, 0) and (5, 0) bands of the $d^3\Delta - a^3\Pi$ system of CO" (in Chinese), J. Optics, 24 (2004) 255-259.
2. **S. Yu**, X. Yang, B. Li, K. Kaniki, S. Wu, Y. Guo, Y. Liu and Y. Chen, "Study of hot bands of the $B^2\Sigma_u^+ - X^2\Sigma_g^+$ system of C_2^- anion", Chinese Physics, 12 (2003) 745-749.
1. K. Kaniki, X. Yang, Y. Guo, **S. Yu**, B. Li, Y. Liu and Y. Chen, "Concentration modulation laser spectroscopy of the C_2 molecular Swan system", Progress in Natural Science, 13 (2003) 736-739.

CONFERENCE PRESENTATIONS: (The name of the presenting author is underlined)

Oral

11. R.S. Ram, **S. Yu**, I.E. Gordon, T. Hirao, and P.F. Bernath, "Fourier transform infrared emission spectroscopy of new systems of NiS", 63rd Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 16-20, 2008.

10. **S. Yu**, J.-G. Wang, P.M. Sheridan, M.J. Dick, and P.F. Bernath, “Laser spectroscopy of the $\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+$ and $\tilde{C}^2\Pi - \tilde{A}^2\Pi$ transitions of SrOD and the $\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+$ transition of BaOH”, 62nd Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 18-22, 2007.
9. T Hirao, **S. Yu** and T. Amano, “Submillimeter observation of HCO⁺ and DCO⁺ in the excited vibrational states”, 62nd Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 18-22, 2007.
8. **S. Yu**, I. E. Gordon, P. M. Sheridan and P. F. Bernath, “Infrared emission spectroscopy of the $A^4\Phi_i - X^4\Delta_i$ and $B^4\Pi_i - X^4\Delta_i$ transitions of CoS”, 61st Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 18-23, 2006.
7. J.-G. Wang, P.M. Sheridan, M.J. Dick, **S. Yu** and P.F. Bernath, “Optical-optical double resonance spectroscopy of SrOH: the $\tilde{C}^2\Pi(000) - \tilde{A}^2\Pi(000)$ and the $\tilde{B}^2\Sigma^+(000) - \tilde{A}^2\Pi(000)$ transitions”, 61st Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 18-23, 2006.
6. R.S.Ram, I.E. Gordon, T. Hirao, **S. Yu**, P.F. Bernath and B. Pinchemel, “Fourier transform emission spectroscopy of the $G^3\Phi - X^3\Phi$, $C^3\Delta - X^3\Phi$ and $G^3\Phi - C^3\Delta$ systems of CoCl”, 61st Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 18-23, 2006.
5. **S. Yu**, A. Shayesteh and P.F. Bernath, “The vibration-rotation emission spectra of gaseous CdH₂ and CdD₂”, 60th Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 20-24, 2005.
4. **S. Yu**, A. Shayesteh, P.F. Bernath and J. Koput, “Infrared emission spectra of hot BeF₂ and MgF₂”, 60th Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 20-24, 2005.
3. **S. Yu**, A. Shayesteh, D. Fu and P.F. Bernath, “The vibration-rotation emission spectrum of gaseous HZnCl”, 60th Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, June 20-24, 2005.
2. A. Shayesteh, **S. Yu** and Peter Bernath, “The vibration-rotation emission spectra of HgH₂ and HgD₂”, 60th Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 20-24, 2005.
1. **S. Yu**, D. Fu, A. Shayesteh, D.R.T. Appadoo and P. Bernath, “Infrared and near infrared emission spectra of SbH and SbD”, 59th Ohio State University International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June 21-25, 2004.

Poster

7. **S. Yu**, B.J. Drouin, J.C. Pearson and H.M. Pickett, “Terahertz Spectroscopy of ions of astrophysical interest”, 2008 JPL Postdoc Research Day Poster Session, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, Aug. 26, 2008.
6. **S. Yu**, J.-G. Wang, P.M. Sheridan, M.J. Dick and P.F. Bernath, “Laser spectroscopy of alkaline-earth monohydroxides: the $\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+$ and $\tilde{C}^2\Pi - \tilde{A}^2\Pi$ transitions of SrOD and the $\tilde{A}^2\Pi - \tilde{X}^2\Sigma^+$ transition of BaOH”, 22nd Annual Symposium on Chemical Physics, University of Waterloo, Waterloo, Ontario, Nov. 3-5, 2006.
5. M.J. Dick, J.-G. Wang, P.M. Sheridan, **S. Yu** and P. Bernath, “Optical-optical double resonance spectroscopic studies of SrOH and CaOH”, 22nd Annual Symposium on Chemical Physics, University of Waterloo, Waterloo, Ontario, Nov. 3-5, 2006.
4. **S. Yu**, I.E. Gordon, P.M. Sheridan and P.F. Bernath, “The infrared electronic spectroscopy of CoS”, 21st Annual Symposium on Chemical Physics, University of Waterloo, Waterloo, Ontario, Oct. 28-30, 2005.

3. **S. Yu**, A. Shayesteh, D. Fu and P.F. Bernath, "Emission Spectroscopy of TeH, TeD and HZnCl", 20th Annual Symposium on Chemical Physics, University of Waterloo, Waterloo, Ontario, Oct. 29-31, 2004.
2. **S. Yu**, X. Yang, B. Li, K. Kanili, S. Wu, Y. Guo, Y. Liu and Y. Chen, "Study of hot bands of the $B^2\Sigma_u^+ - X^2\Sigma_g^+$ system of C_2^- anion", 19th Annual Symposium on Chemical Physics, University of Waterloo, Waterloo, Ontario, Oct. 29-Nov. 2, 2003.
1. **D. Fu**, **S. Yu**, D.R.T. Appadoo and P.F. Bernath, "Study of the FT IR and near-IR Emission Spectra of SbH", 19th Annual Symposium on Chemical Physics, University of Waterloo, Waterloo, Ontario, Oct. 29-Nov. 2, 2003.

HONORS AND AWARDS:

- NASA Postdoctoral Program Fellowship at Jet Propulsion Laboratory 2007-2008
- University of Waterloo, Chemistry Department, F.W. Karasek Scholarship 2007
- Ontario Graduate Scholarship 2006-2007
- The University of Waterloo President's Graduate Scholarship 2006-2007
- University of Waterloo, Chemistry Department, H.G. McLeod Scholarship 2006
- Chinese Government Award for Outstanding Self-Financed Students Abroad 2005
- East China Normal University, Excellent Postgraduate Student Scholarship 2001
- East China Normal University, Title of Excellent Graduate 2000
- East China Normal University, Excellent Student 1999
- East China Normal University, Award of Top Grade 1999
- East China Normal University, Second Award of Scholarship 1998
- East China Normal University, Second Award of Scholarship 1997